STAT5505 Design of Experiments

Professor:
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Office Hours: Tuesday 2-3 pm. Wednesday 11-noon; if you are unable to see me during these times, please schedule an appointment (email contact is suggested)

Course Outline:
1. Linear Models: Review of matrix theory and linear model theory; unified approach to missing plots.
2. Complete Randomized Design, randomization theory of inference
3. Randomized Block, randomization theory of inference; analysis with treatment errors; efficiency of randomized block design.
4. Latin Squares, orthogonality of factors; randomization theory for Latin squares
5. Mutually orthogonal Latin Squares (MOLS) (and construction via Galois fields); Graeco-Latin squares, crossover designs
6. Split plot designs, strip plot designs
7. Balanced Incomplete Blocks (BIB), combinatorial properties of balanced incomplete block designs; intra- and inter-block analysis for BIB, efficiency factor; group divisible designs
8. General Incomplete Block Designs and partially balanced incomplete block designs, Youden squares, construction and analysis
9. Factorials: $2^k, 3^k, p^k$, confounding and fractional replication
10. Response surface theory; method of steepest ascent, canonical analysis of a response surface; factorial and composite designs for response surface analysis; rotatable designs
11. Optimal designs (if time)

Approach in conducting an experiment:
1. Statement of the problem
2. Formulation of hypothesis
3. Devising of experimental technique and design
4. Examination of possible outcomes and references
5. Check on assumptions
6. Performance of experiment
7. Statistical analysis
8. Inference - drawing conclusions - measures of reliability of estimates
**Grading:**
Assignments: 4 @ 15% each  
Final: 40%

**Text:**
Course notes by Prof. S. Mills  

**References:**

**Classic:**  

**Advanced:**  
Scheffe, H. (1959) *Analysis of Variance*, Wiley

**Intermediate:**  
Kempthorne, O. (1952) *The Design and Analysis of Experiments*, Wiley  

**Applied:**  
Cox., D. R. *Planning of Experiments*, Wiley  
Box, Hunter and Hunter (1978). *Statistics for Experimenters*, Wiley  
Industrial:
Davis, O. (1954) *Design and Analysis of Industrial Experiments*, Oliver & Boyd

Papers:
Kempthorne, O, 1977 "Why randomize", *JSPI*, 1, 1-25